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Building A Future

An Overview of Resource Development

The Management of
Forests on Reserve



Canada

The Management of Forests on Reserve

Published under the authority of the
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Table of Contents

Introduction and Acknowledgements	1
Development Policy and Forestry	3
The Importance of a Development Policy	3
Identifying Woodland Potential	4
Assessing Commercial Possibilities	4
The Economic and Social Benefits of Forest Management and Their Price Tag	5
Providing for Future Development	7
"Managing" the Forest: What Does It Mean?	9
Advantages of a Formal, Written Forest Management Plan	10
Planning to Manage the Forest for Non-Timber Resources	10
Visualizing Multiple Land Uses	10
Developing Your Own Forestry Management Plan	13
Taking Stock of Your Forest Resources	13
Writing up the Forest Management Plan	15
The First Nation's Decision	19
Cultivating Your Forest as Described in Your Management Plan	23
Basic Silvicultural Activities	23
Intensive Silvicultural Activities	26
Harvesting, the Environment and Integrated Resource Management	31
Logging Plans	31
Logging Rationale, Strategies and Methods	31
Silviculture Systems	32
Logging Activities Common to All Systems	35
Felling and Bucking	36
Affordable Logging and Processing Equipment for Small Operations	37
Protecting the Environment	37
Legal and Regulatory Requirements for Harvesting	38
How Will You Be Paid for Your Timber?	39

Forest Access41
Protecting Your Woodlands43
Protection Against Pests and Diseases43
Fire Prevention and Suppression43
The Business of Forest Management45
Appendix A - Advisory and Assistance Programs47
Appendix B - Offices of the Department of Indian Affairs and Northern Development48
Appendix C - Offices of the Canadian Forest Service49
Appendix D - Provincial and Territorial Forestry Departments50

Introduction and Acknowledgements

In Canada, there are 240 First Nations with more than 1,000 hectares of forest on their reserves, and about 1,000 reserves that each contain at least 20 forested hectares. All of these woodlands have potential for forestry development.

This booklet sets Aboriginal forestry development in the context of modern forestry, that is, forestry which focuses on preserving the woodland environment and improving all its resources — not just timber production. It is forestry that balances the needs of *all* who use the woodlands; as such, it is in harmony with Aboriginal values.

The following text describes forest management on reserve, the activities involved in carrying out management plans and the income, employment and skills developed by these activities. It owes much to the publication, *Managing Your Woodland: A Non-Forester's Guide to Small Scale Forestry in British Columbia*,¹ and to the supplementary explanations provided by the Aboriginal Liaison Officers of the Canadian Forest Service across Canada who gave generously of their time.

This is one booklet in the series, *Building a Future: An Overview of Resource Development on Reserves*. The series was prepared by the Department of Indian Affairs and Northern Development (DIAND) in response to First Nations' requests for information on the beneficial use of their natural resources. Designed as information handbooks, each looks at a different resource from the point of view of a First Nation community. Is development a choice? If so, what is the best way to plan and benefit from that development?

The information provided here is useful for First Nation councils whether they intend to manage forestry development themselves, or delegate that responsibility to First Nation corporations, joint-venture companies or non-Native persons licensed to cut or purchase timber from a reserve.

¹ This publication was prepared under the Canada-British Columbia Partnership Agreement on Forest Resource Development and updated and reprinted in 1992. It has been used here with the kind permission of the British Columbia Regional Office of the Canadian Forest Service of Natural Resources Canada.



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Development Policy and Forestry

The Importance of a Development Policy

The need for a development policy arises when a community decides to pursue any kind of economic activity. Development of a resource such as forestry, or even the consideration of its development, is easier with a global policy already in place as a framework.

This framework policy helps establish the conditions and limits of development set by the community. It identifies opportunities to examine and ways to harmonize economic progress with environmental protection and social and cultural traditions.

Experience has shown that communities that pursue economic development successfully do so by first outlining a global plan for the best use of limited time, funds and personnel. Their plan is a kind of road map, guiding successive First Nation administrations who will be implementing it over the years on behalf of the whole community.

Probably the most important point about a development policy is that it be built through community participation. When First Nation members have been consulted, they are more likely to support the policy and, through it, the community speaks with one voice. In addition, if the plan is written, rather than verbal, the objectives of development are on record and easy for all to see.

Forestry

Most communities look at a broad range of possibilities — tourism, real estate, forestry, sand and gravel projects — before zeroing in on the most feasible. In forestry, even 20 hectares of woodland can offer development potential.

Exploring the possibility of forestry development does not have to take a lot of time, energy and money. All you will need is some basic information. The simplest way to get this information is to talk to knowledgeable people in your area — federal and provincial forestry officers and other First Nations and companies in the business. There are a few main facts to establish.

- What forest products — timber and non-timber — could come from your woodlands?
- What skills does their production develop?
- Are these products and skills saleable? (In other words, do they have market potential?)
- What are the benefits — financial, environmental, social, etc. — of producing these goods and services, and what are the costs?

Keep in mind that in developing the economic potential of the forest, its beauty and tranquillity can be preserved.

Identifying Woodland Potential

The species, age, quality and condition of the trees on your reserve, and their accessibility, determine their economic uses. The range of possibilities is wide and includes the development of forest products, forest-based tourism and forestry services.

Forest Products

There are the *major wood products* such as sawlogs, peeler logs and pulpwood. In addition, there are *specialty wood products* such as Christmas trees, cribbing, fence posts, firewood, shakes, shingles, mining timbers, grape stakes and pilings. There are also *non-wood crops*: forage for livestock; wild foods such as nuts, mushrooms, berries, fiddleheads, herbs, medicinal plants and wild rice; honey; seeds and cones for florists and traditional crafts; and crops that improve wildlife habitat, and attract and shelter game for better hunting and trapping.

Forest-Based Tourism

Equally important is the recreational potential that forests provide as a locale for skiing, biking, snowmobiling, nature trails, canoeing, white water rafting, birding, cottages, and fishing and hunting camps. Aboriginal ecotourism offers significant potential. Well-managed forests can supplement such other tourism assets as crafts, historic and educational sites, performing artists and interesting industries, thus providing additional incentives for tourists.

Forestry Services

Forestry services are as saleable as forest products. There are opportunities for a First Nation to provide services to provincial forestry departments and private forestry companies for tree planting, thinning, pruning and for road construction and maintenance. In addition, provincial and municipal highway departments, provincial and national parks, and power and communications utilities all hire crews to thin and prune trees, clear brush, protect watersheds and stream banks, plant road banks and operate machinery. Provincial governments also hire trained fire suppression crews.

To narrow the possibilities appropriate for your First Nation, you can draw up a list of potential products and services and compare it with your community's goals, matching items in order of priority.

Assessing Commercial Possibilities

Let's say you've chosen a range of forest products you'd like to explore. How do you determine which ones are saleable and which ones will generate jobs? To answer these questions you'll want to consider these factors.

- Who will buy and at what price? In most of Canada, local mills are the biggest buyers of timber. Contact them to determine your potential market.
- Are the potential markets local, national or international? How would you ship to your markets?

-
- Would a mix of products generate a steady income?

For example, would honeycombs, firewood, Christmas trees and peeler logs be a good combination? To find out, investigate who sells these products and how they do it. Then talk to their customers to see if there is room for a new supplier. For forest foods, such as honey, blueberries and fiddleheads, local merchants are the most likely customers. Personal visits to grocers, florists and specialty shops are invaluable in assessing the market.

- What products would generate the highest levels of employment and build on the skills and aptitudes of First Nation members? Are these skills marketable off reserve as well?

In assessing the market for forestry services, talk to potential buyers from highway departments, provincial and national parks and power or communications utilities.

- Would sale of your products support an on-reserve business? If not, could the enterprise be expanded to related activities off reserve?
- Is recreational development a good choice?

Customers for recreational facilities on reserve — cottagers, hunters and fishermen, for example — are often people from neighbouring towns. Talk to local clubs and associations to find out what facilities would interest them.

- Could one forestry project lead to another, creating spin-offs in both products and services, in order to spread income through the community?

You only need preliminary answers to these questions to determine whether to include forestry in your development plan.

The Economic and Social Benefits of Forest Management and Their Price Tag

Benefits

Forest management will help you get the most from your forest. Whether you want to maximize timber revenues and employment, preserve your forest in a healthy natural state, or develop wildlife habitat, forest foods or campsites, forest management will help you do it effectively.

The benefits you can obtain depend on what you decide to do. If you look at forests in terms of timber production, forest management can stimulate faster growth of commercially valuable trees; this, in turn, leads to more harvesting employment for First Nation members and increased revenues. Furthermore, harvesting experience on reserve can put First Nation companies in a competitive position to get off-reserve harvesting contracts.

But there is more to forest management than timber harvesting.

Managing the forest also provides other kinds of employment for First Nation members. The skills acquired in resource planning, fire protection and suppression, and in silvicultural operations, such as planting, thinning, pruning and site preparation, position First Nations to win contracts for similar work off reserve. Effective management of the on-reserve forest lets First Nations demonstrate to provincial and territorial governments their ability to participate in the co-management of off-reserve forests.

Forest management also allows various community objectives to be accommodated at the same time. For example, selecting an appropriate system for timber harvesting and forest regeneration can improve the habitat for wildlife and lead to increased revenues for trappers and hunters. And harvest operations can be designed so recreation and tourism are not affected negatively.

In addition, forest management can promote the goals of social programs. One of the best examples of this is provided by an Alberta First Nation where Elders have proposed a bush camp to reintegrate young offenders into the community. They are offering the young people a fresh start by teaching them traditional guiding, hunting and trapping skills, and by rekindling the holistic Aboriginal ethic which respects the forest's multiple uses.

Monetary Costs

Of course, there are costs in managing a forest. The starting points in forest management — an inventory of all resources and a management plan — require money and community time to develop.

Funds are also needed to implement a management plan, and the return on money invested here is not immediate. For example, a plan may call for expenditures on tree planting. In this case, the community may have to wait years to earn income from these expenditures. Meanwhile, it must cover the cost of protecting the forest against disease, insects and fire. If, in contrast, a plan calls for thinning and pruning, saleable small wood products may be available at once. Even here, however, it may take several seasons before operations show a profit. Usually, in the early years, just covering costs can be a challenge. Success in the long term depends on maintaining realistic expectations, keeping operations to a manageable size at the start and slowly finding the level of activity that supports a viable business.

The Costs of Human Resource Development

In communities of moderate size, the number of new jobs forestry development can create will be limited — and most of them are seasonal. As well, not all First Nation members will find these jobs appealing or be able to perform them. Forestry work is physically demanding and is classified officially by provincial labour codes as a hazardous occupation.

Consequently, forestry workers need training to ensure the safety and efficiency of operations. They require perseverance and stamina to withstand long hours and tough working conditions, and to meet tight deadlines. Moreover, it can take years to develop the required skills, assemble trained and disciplined crews and find foremen/forewomen who make good leaders. Effective business managers are not easy to find either, since they must combine a knowledge of forestry and silviculture with business and administrative skills.

Nevertheless, despite the difficulties, many First Nations have established successful forestry operations. Because of the quality of their work and their competitive prices, private companies and provincial Crown land managers seek out their services. These successful First Nations affirm that the time, energy and daily effort needed to build their reputation and self-reliance were worth it, and that their commitment freed them from dependency and let them take charge of their communities' future.

Other Considerations

After you have examined the potential of your woodlands to generate saleable products and services, answers to the following questions will help you determine whether to go ahead with forestry development.

- Are the long-range benefits likely to justify the costs?
 - When should development occur — now or later?
-
- ### Providing for Future Development
- You may decide to postpone forestry development. Not all First Nations with forestry potential start exploiting it right away. You may only want to identify an area for possible future development on a land-use map, pass zoning by-laws to protect it from activities which would spoil future forestry and take precautions to protect the forest from fire and disease. (See the chapter "Protecting Your Woodlands.") You may also want, when planning the overall community network of roads, to consider including access roads to the zoned area to facilitate any future development.
-
- How would forestry development, compared with development in other sectors, affect the cultural values important to your community?
 - What size development is possible or desirable — small or large scale?

"Managing" the Forest: What Does It Mean?

A forest, like any garden, will grow to the limits of available light, soil nutrients and water if left untended. It will support a variety of plants, seeding-in from plants on the site as well as from seeds carried by wind or dropped by birds and animals. It will grow without discriminating between crops.

By managing, or cultivating, the forest you can choose the dominant crops it produces, creating and maintaining the overall forest environment your community wants. This is silviculture (from the Latin words "silva" meaning wood or forest, and "cultura" meaning cultivation).



Managed

Unmanaged

Figure 1

Your community's objectives in forest cultivation might be to:

- manage *all* the resources — plant, animal, fish, water and soil — to achieve a balanced, holistic environment;
 - create openings for forage production and grazing;
 - improve access to certain areas for recreation and wildlife;
 - enhance spiritual and aesthetic values;
 - reduce losses caused by insects, disease and fire;
 - reduce the loss of trees that die from competition for light, space or nutrients;
 - encourage the growth rate of the trees to increase the number of harvests;
 - control the density and mix of trees to improve timber productivity;
 - control the species and mix of trees to improve wildlife habitat; and
 - protect watersheds, stream banks and fish habitats.
- Cultivating a large area of forest is complicated. Shaping your forest to match your community goals takes careful planning and includes many steps:
- setting goals;
 - identifying several options for achieving them;
 - selecting the preferred option;
 - developing a set of actions — your operational plan — to carry out this option; and
 - monitoring the plan to make sure that, as time passes, the actions and goals continue to be appropriate, or changing it if necessary.

This last point is really important: forest management plans must keep pace with a living, changing entity — the forest itself — and with an evolving community, changing market conditions, and new scientific information and silvicultural methods. Your plan, therefore, must be reviewed periodically and modified when appropriate to keep it up-to-date and in harmony with your changing goals.

Advantages of a Formal, Written Forest Management Plan

A formal, written forest management plan clarifies the benefits you want from your woodland, identifies ways of achieving them and helps select the benefits preferred by your First Nation. Developing a written plan needs a qualified professional.

Good forestry practice requires that a management plan address "integrated resource management." That means the plan must give appropriate consideration to wildlife, recreation, watersheds, fish, timber, etc. The plan, therefore, must take account of how the management of each resource affects the others, and lay down specific guidelines for timber harvesting to safeguard the non-timber resources. It must define compatible activities that may be conducted in the same area simultaneously, and incompatible operations that can only take place in the same area at different times.

In drawing up the plan, a professional forester divides the woodland into separate management units. The division is based on each area's characteristics and, consequently, an area of similar trees, soil and terrain would be treated as one management unit.

You can have separate development objectives for each unit. For one, it may be the protection of sacred sites and medicinal plants; for another, it could be the improvement of wildlife habitat for trapping, or development of camp sites, or it could be road building to an area soon to be harvested, treated for disease or reforested after a fire. One First Nation's unique objective is to use a management unit as an outdoor classroom where school children study the forest ecosystem in a "living laboratory."

Planning to Manage the Forest for Non-Timber Resources²

First Nations have great flexibility when choosing their management objectives and are not limited to timber harvesting. This is why they commission a global inventory of the trees *and* all of the non-timber resources as well. This global inventory identifies the location of each resource so that each and every one may be preserved. Then, any one resource (or several of them) can be developed, either for its cultural importance to the First Nation or as a business venture.

Visualizing Multiple Land Uses

Preparing a series of maps, one for each resource, is an effective way of building a picture of the full potential of your forest. By drawing each map on acetate, see-through paper, and laying one transparent sheet over another, you can see possible conflicting uses right away — and plan accordingly. As new information is collected, it can be added to the maps.

² Management for timber resources is discussed in the chapter entitled "Harvesting, the Environment and Integrated Resource Management."

Planning Recreation

When deciding which area of the forest to reserve for recreational activities, consider the lay of the land, its watersheds, plant and animal life, delicate soils and any cultural sites that need protecting. The extent and style of any development is up to you. For example, you may want to build trails, viewing platforms or blinds for wildlife, or you may want to use other areas for camp sites to rent out. Whatever your choice, the preservation of the cultural and recreational areas of your forest depends on keeping them separate from the traffic, noise and view of logging or silvicultural activities.

Enhancing the Wildlife Habitat

Wildlife management is largely habitat management. Many Aboriginal communities are well equipped for the task because they understand the food, water and shelter needs of different animals and know how to modify habitats to provide for these needs. For example, if deer are short of forage, you might stimulate the growth of browse vegetation by prescribed burning or by trimming back certain trees to let more light into the woods. The method chosen would be specified in the forest management plan, because it is important to decide ahead of time how to encourage reproduction in particular wildlife species or to lure back some that have disappeared.

Developing Range and Agro-Forestry

The practice of cultivating forage crops along with a stand of trees is called agro-forestry. If the trees and the farm crop are planted side by side, the trees shelter the agricultural crop. Alternatively, the forage crop can be planted under the trees — as in parts of British Columbia where livestock

graze in the shade of Douglas fir and pine. Grazing domestic livestock on forage crops is an important forest land use. By adopting specific range and forest management practices you can provide the forage and fences required to raise cattle in distinct management units of your woodland, separate from units where wildlife habitat is protected.



Figure 2

Agro-forestry: grazing and raising forage crops can be important activities on forest lands.

Forage crops are often sown on woodlands that have been either clear-cut or devastated by fire. Good quality forage is also produced in areas where controlled burning, selection cutting, thinning or pruning has opened dense stands for grazing. You can direct the forester to specify in your plan which of these activities would be appropriate for your woodlands to develop agro-forestry.

Agro-forestry works well in intensive small-scale operations, suitable to the size of many reserves. In one management unit you can plant fast-growing crops (such as Christmas trees, berry bushes, seedlings) next to, or under, slow-maturing trees that are being grown for saw logs. In another unit you can harvest wild crops every year

— reeds and greens for ornaments and wreaths, flowers, medicinal plants, fiddleheads, mushrooms, edible roots and herbs. In the open woodland unit you can raise pigs and chickens. You could even try fish farming, now that trout are being pond-reared successfully in some woodland streams.

Developing Your Own Forestry Management Plan

Because the plan you develop expresses your community's objectives, it is important to work closely with the forestry consultant you hire. When the consultant understands your goals, he or she can set down several options to reach them. The consultant can explain why one choice may be preferable to another and how your decisions will affect future forestry activities.

Taking Stock of Your Forest Resources

Before a management plan can be developed, foresters need to make an inventory of the woodlands. An inventory describes:

- history of past disturbances, man-made and natural (cutting, fire, etc.);
- non-timber resources, such as wildlife, recreation areas, archaeological and historic sites, spiritually or culturally important areas, water resources, sand and gravel deposits;
- timber resources, including species distribution, stand age, stand height, stand stocking, stand volumes and log grades if relevant, and site quality;
- condition of the forest (decay, disease, pests); and
- environmental sensitivity (soil, water).

The inventory varies in detail according to the purpose for which it is made — either long-range planning only, or pre-harvest stocktaking.

The starting point for an inventory of the forest's resources is to consult with forest users in the community. Their traditional, ecological knowledge is invaluable and needs to be incorporated in the forest management plans.

The Cruise and How It Works

Next, a "cruise" of the forest will collect information about what it contains and what it is capable of producing in the future. The cruise of your forest — whether for planning or harvesting — should be conducted by a professional forester. He or she does not examine every hectare. Instead, the forester selects typical areas — called sample plots — and constructs from their characteristics a picture of the whole forest: what is growing there; its age, condition and growth patterns; the volume of saleable timber and its quality; and the nature and location of all other forest resources.

A forester usually works with an assistant, who could be a First Nation member, hired to help with measuring, marking boundaries and marking trees slated for the different silvicultural treatments the forester will prescribe to keep the forest healthy.

Compilation, Processing and Use of Cruise Data

From the cruise information, the forester creates an updated forest cover map. It shows the location of the sample plots, timber and soil types, water and topography and where roads and landings can best be built. It also identifies environmentally sensitive areas, wildlife

habitats or ranges, potential recreation sites for protection and stands requiring silvicultural treatments. The map is a kind of snapshot of your plan for the protection, management, development and harvesting activities on reserve.

Information from the cruise often affects your preliminary management objectives and activities. Suppose, for example, that one preliminary goal was to produce significant annual revenue from sawlogs — starting immediately. Unfortunately, an inventory reveals that, out of 100 hectares of cedar, only seven contain commercially valuable trees, ready for harvest over the next 15 years. The conclusion, therefore, is that harvesting cedar sawlogs is not going to result in immediate, significant, annual revenues.

However, your inventory also reveals that thinning some of the larger, immature stands would produce special high-value products, such as cedar poles or fuel wood. With this information you can modify the preliminary goal to produce sawlogs and focus on the more realistic income from cedar poles and firewood.

In a pre-harvest or immediate operational cruise, where the purpose is to develop a logging plan, the forester also compiles data according to harvesting and sales specifications. He or she indicates minimum cutting diameter for each species — for example, lodgepole pine, 12.5 cm; Douglas fir and larch, 27.5 cm; all others, 17.5 cm. Using a computer, the forester then sorts the data to determine the volume of each species to be cut, as well as the volume not to be cut.

Writing up the Forest Management Plan

A typical forest management plan starts with a statement on the community's long- and short-term goals. The statement is the product of discussions between the

community and the professional forester. The statement developed by one community is presented in Table 1. Notice that this community's goals included not only timber production, but also agro-forestry, recreation and wildlife habitat development.

Table 1: Community Goals and Benefits Sought

For Land and Forest Resources

- To tend, improve and increase the value of the standing trees
- To harvest mature trees periodically and ensure successful regeneration
- To rehabilitate areas previously harvested that did not regenerate properly, introducing species that mature for harvest at different intervals and agro-forest crops for annual rotation
- To establish a seedling nursery business and Christmas tree farm on reserve
- To improve the wildlife habitat, promoting the return of deer and moose, small game and waterfowl
- To develop recreational areas — trails, camp sites and cottages

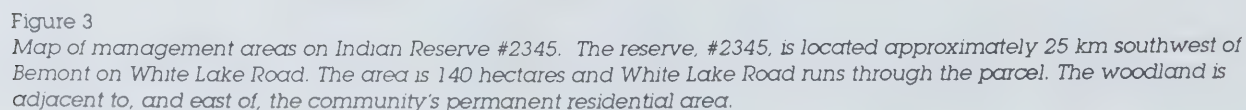
For Human Resources

- To develop job skills useful on and off reserve
- To establish competent teams to perform forestry services on and off reserves
- To develop management skills
- To refocus on holistic traditional values compatible with modern forestry jobs

For Financial Resources

- To earn at least \$2,000 annually, during the first 10 years from harvesting and the sale of high value thinnings and agro-forest crops
- To finance the seedling nursery and Christmas tree farm from the above revenues
- To earn increasing and steady income, after the first 10 years, from periodic harvests of Christmas trees and other species planted as they mature, and from recreational development
- To increase and spread employment income through the community

divided into five management areas (MAs), each defined according to the type of forest cover and the activities suitable there. Tables 2, 3 and 4 which follow summarize numerically the productive capacity of each area and describe the resource use.



It is important to note that these tables have been simplified and do not list all possible alternatives. When working with professionals, First Nations would be provided with more detailed information on the soil, topography, etc., to assist in decision making.

Table 2: Description of Management Areas

Management Area (MA)	Description	Possible Uses
MA 1	70 hectares, fir, and cedar type, 200 years old, 300 stems/hectare, medium site, MAI $3.5 \text{ m}^3/\text{yr}$.*	Some deer-use area for spring range. Breeding ground.
MA 2	40 hectares, fir with lower proportions of cedar, 60 years old, 1,200 stems/hectare, medium site, MAI $3.5 \text{ m}^3/\text{yr}$. Forest floor coverage on two hectares - medicinal herbs.	Stand improvement to produce high-value products. Suitable for seedling nursery on east half. Sacred sites and cemetery on half-hectare to be preserved. Traditional herbs may be gathered.
MA 3	15 hectares, non-commercial brush-covered land.	Originally cleared for agriculture but found to be unsuitable. Suitable for Christmas trees and forage crops, grazing sheep, raising pigs and chickens.
MA 4	10 hectares, birch with lower proportions of cedar, 40 years old, medium site, 800 stems/hectare, MAI $3 \text{ m}^3/\text{yr}$	Wild grouse and a variety of fur-bearing mammals (marten, weasel) use the area; brook and rolling terrain with mountain views. Cottages, campsites, trails, sport fishing, trapping.
MA 5	Five hectares of marshland, swamp and pond.	Swamp and small pond that attract ducks and geese; hunting blind.

* See legend for Table 3

Table 3: Forest Cover and Timber Volumes

Management Area (MA)	Forest Type	Area (ha)	Volume (m ³)	Age Class	Height Class	Stocking Class	Site Class	MAI (m ³ /yr)
MA 1	FC	70	40,000	8	4	1	M	3.5
MA 2	F(C)	40	-	3	3	0	M	3.5
MA 3	NCBr	15	-	-	-	-	M	3.5
MA 4	EP(C)	10	-	2	2	0	M	3
MA 5	Swamp/ Pond	5	-	-	-	-	-	-

Legend for Table 3

Forest Type:

FC: Fir and cedar in equal proportions

F(C): Fir with lower proportion of cedar

NCBr: Non-commercial brush

EP(C): Birch with lower proportion of cedar

Volume:

Annual harvest in cubic metres

Age Class:

20 year classes up to 140 years; 50 year classes thereafter

Height Class:

1=10.4 metres; increases thereafter by 9 metres for each successive class

Stocking Class:

Stand density, i.e., trees per hectare with minimum diameter of 27.5 cm:

0 = immature, and 1 = mature with more than 76 trees per hectare

Site Class:

MAI (m³/yr):

Productive potential of site: M= Medium

Potential mean annual increment, i.e., average annual increase in wood volume (in cubic metres) that could be expected if appropriate silviculture is undertaken

Table 4: Non-Timber Resources

Capability	Management Area (MA)	Description
Wildlife	MA 2, MA 4, MA 5	Moderate for deer; good for marten, weasel; excellent for waterfowl and grouse.
Medicinal plants	MA 2	Life everlasting, gold thread, red and white baneberry, male fern, club moss, yellow parello.
Recreational sites	MA 2, MA 4, MA 5	Rolling terrain; mountain view; pond; wildlife; suitable for trails, cottages or camp sites; duck blind.
Agro-forestry	MA 3	Suitable for forage and grazing and Christmas tree farm.

Table 5: Options

Option 1

- Harvest MA 1 in its entirety (less a 30-metre strip bordering road) over the first 10-year period, and plant immediately each year; seedlings, initially purchased outside, to be grown by year four in the band's own seedbeds. The main product will be sawlogs. The annual volume cut depends on market conditions.
- Thin MA 2 periodically after harvesting in MA 1 is complete and sell the thinned-out wood to raise funds to start seedling nursery.
- Plant Douglas-fir Christmas trees in MA 3 for a seven-to-10 year harvest cycle.
- Construct a dual-purpose mountain bike/cross-country ski trail, starting at the residential area of the reserve, passing through MA 2 to MA 4 and encircling the perimeter of the pond in MA 5 with a connecting link there to White Lake Road.
- Enhance MA 4 and MA 5 for wildlife and recreation.

Option 2

- Same activities as in Option 1, but carry out harvesting in MA 1 and tending and commercial thinning in MA 2 at the same time during first 10 years. Also selecting plant species that would mature at 20 and 50 year intervals.

Option 3

- Same activities as Option 1, but extend harvest period for MA 1 to 20 years and start commercial thinning in MA 2 immediately.

In this case, once the description of timber and non-timber resources was set out in the plan, the forester's next step was to match community objectives with the resources in each management area. (Such a match identifies development options, suggests specific activities to undertake and alternative time frames for operations to begin.) The forester drew up, therefore, a choice of strategic options for the First Nation to consider and described in detail the operational and financial implications of each option in the text of the plan. The main points are summarized in Table 5. Note that each option outlines specific management objectives and activities for the five MAs.

It was then up to the First Nation to decide which option to pursue and up to the forester to develop a five-year operational plan to achieve the objectives of the option selected.

The First Nation's Decision

All three options were forest friendly. Appropriate harvesting schedules would protect the deer in MA 1; preserving the trees in a 30-metre strip on either side of White Lake Road and enhancing the fish and wildlife habitats would protect the aesthetic quality of the whole forest.

After studying the financial and operational implications of each option, the First Nation selected Option 2 described in Table 5. The thinnings from MA 2, which would improve the stand and would be sold as high-value cedar poles and firewood, would provide them — in addition to harvest revenues — with periodic income beginning in year one. This would generate enough income in the first three years to develop a mountain bike/cross-country ski trail to the wildlife area in MA 4. Additional income would be generated by the Christmas trees in MA 3 from year seven on and later by the development of campsites or cottages along White Lake Road. These spin-offs would mean more jobs and more skills.

Option 2 also had this important further advantage over Option 1: immediate stand improvement work in MA 2 would allow the First Nation to get started right away on training members in tending and commercial thinning, and not just concentrate on logging and planting in the first 10 years. It would, therefore, develop both a more diversified work force and experienced teams more quickly.

With the strategic option and management objectives selected, the forester developed the operational plan and schedule shown in Table 6. The plan covered the five-year period from January 1, 1993 to December 31, 1997. It included details on all activities to be carried out, stating who would do them and when, where and how. Note that activities in this plan begin with road construction and repair. This First Nation wanted to ensure access for the operations planned — harvesting, planting, stand improvement and recreational development. The plan also provided for ongoing administrative review of activities and for updating the plan.

The operational plan was accompanied by a business plan which estimated the cost of each activity and specified where the money would come from, and when. This allowed the First Nation to decide if it could afford the work and to make sure the money was available when required for each activity. Since the success of silvicultural operations depends on performing them in the correct season, timing the arrival of funds is particularly crucial.

Table 6: Five-Year Operational Plan and Schedule

Activity	Timing	Area	Location	Description	Work to be Done by:
Road Construction and Repair	1993 summer	MA 1	Spur A	- repair skid trail.	Lawyer draws up construction contract. Outside construction company carries out the work while employing some band crews.
	1993 summer	MA 3	Spur B	- construct spur road 3.5 m wide surface with gravel as needed. - construct access to new Christmas tree plantation.	
Harvest Cut	1993 summer	MA 1	Block 1	- clear-cut 7 ha hand fell, skid with tractor.	Band Council secures a timber permit after hiring a professional forester to develop a logging plan and passing a band Resolution. Band crews carry out the logging.
	1994 summer	MA 1	Block 1	- clear-cut 7 ha hand fell, skid with tractor.	
	1995 summer	MA 1	Block 2	- clear-cut 7 ha hand fell, skid with tractor.	
	1996 summer	MA 1	Block 2	- clear-cut 7 ha hand fell, skid with tractor.	
	1997 summer	MA 1	Block 3	- clear-cut 7 ha hand fell, skid with tractor.	
Site Preparation	1993 fall	MA 3		- remove brush with brush blade on tractor, burn slash, scarify.	Band crews
	1993 fall	MA 1	Block 1	- burn slash, clear site, scarify.	Band crews
	1994 fall	MA 1	Block 1	- burn slash, clear site, scarify.	Band crews
	1995 fall	MA 1	Block 2	- burn slash, clear site, scarify.	Band crews
	1996 fall	MA 1	Block 2	- burn slash, clear site, scarify.	Band crews
	1997 fall	MA 1	Block 3	- burn slash, clear site, scarify.	Band crews
Planting	1994 spring	MA 3		- plant D-fir, 2+1 bare root for Christmas tree production.	Band crews
	1994 spring	MA 1	Block 1	- plant D-fir, cedar, 2+0 container stock.	Band crews
	1995 spring	MA 1	Block 1	- plant D-fir, cedar, 2+0 container stock.	Band crews
	1996 spring	MA 1	Block 2	- plant D-fir, cedar, 2+0 container stock.	Band crews
	1997 spring	MA 1	Block 2	- plant D-fir, cedar, 2+0 container stock.	Band crews
Stand Improvement/Tending	1993/1997	MA 2		- thinning as per marked trees, pruning, brushing, pest control.	Band crews
	1995/1997	MA 3		- Christmas tree shearing, protection activities.	Band crews
Recreational Development	1994/1995	MA 2, 4, 5	see map	- begin to clear brush, thin and prune for x-country ski/bike trail from residential area to MA 4 and around pond.	Band fire crew while on stand-by
	1996 summer	MA 1, 4, 5	see map	- construct trail from White Lake Road to connect to trail around pond.	Band fire crew while on stand-by
	1996 fall	MA 4	see map	- construct waterfowl blind.	Band Youth Project
Administration and Co-ordination with Business Plan	1993/97, ongoing	MA 1-5		- review and, as required, update Forest Management Plan, and 5-year Operational Development Plan and Business Plan.	Manager of Band Corporation (who reports to Band Council) in consultation with professional forester, certified accountant, professional business consultant and lawyer.

Cultivating Your Forest as Described in Your Management Plan

Your management plan describes the silvicultural treatments to be carried out to ensure the health and improve the quality of your forest. Since it is written in a forester's language, it is helpful to understand the forester's technical terms, what the treatments are, why they are carried out and how.

It is important to realize these silvicultural activities can be performed by First Nation members. The practice of silviculture on reserve, therefore, not only helps your forest but also provides jobs and supports businesses in your community.

As most of these activities require special skills, training members to do the work successfully and *safely* is critical. Trying to undertake it without training, and without an experienced foreman/forewoman to guide workers, is a recipe for failure. Fortunately, training programs are available, as is funding to cover training costs.

The following sketches and commentary explain the seven principal silvicultural treatments, or tending activities, in a forest. The first four are called basic activities and the last three intensive activities.

Basic activities are designed to ensure "free-growing" trees, either following natural regeneration or after seedlings have been planted. In other words, basic activities — carried out during the first five to 10 years of the new tree's life — ensure that these trees have a good start and that they are higher than competing vegetation. In contrast, intensive treatments are designed to improve the value of an already free-growing stand of trees, and to enhance other forest resources as well.

Basic Silvicultural Activities

Site Preparation

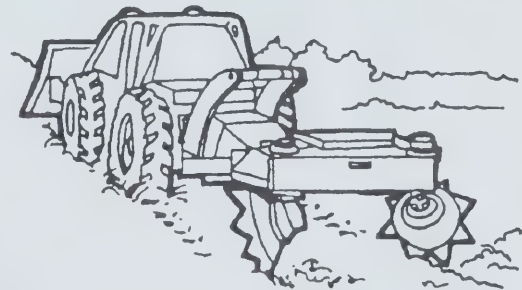


Figure 4
Site preparation by machine to create a favourable seedbed and speed up reforestation.

Site preparation involves the removal of vegetation or logging debris from the area to be seeded, called the seedbed. It prepares the soil for planting or natural regeneration, reduces fire hazards and controls pests and diseases.

Site preparation may involve manual clearing, burning or breaking up logging slash or windfall — all obstacles to successful reseedling. It can involve the use of heavy machines to remove competing vegetation or expose mineral soil to create a favourable seedbed.

The method selected depends on the site conditions, silviculture system and management objectives for the area. Since there are many technical factors to consider and a range of costs, on-site consultation with an experienced forester will help you choose timing, methods and equipment.

Seedling Care



Bare root Container stock

Figure 5
Seedlings can be purchased with "bare root" or as "container stock" with the roots protected in soil from the nursery.

Obtaining, growing, transporting and storing seedlings or cuttings correctly for reforestation are crucial activities of seedling care.

Precautions

Seedling care, between the day the stock leaves the nursery and the day it is planted, is extremely important. Overheating is the biggest danger. A forester can advise you on shipping, storing, thawing and handling container and bare root stock.

Planning Ahead

Since seedlings take from one to five years to produce, they must be grown, or ordered from a supplier, at least a year and a half before planting. If you harvest this fall, prepare the site next fall and plant the following spring, you start growing your container stock the same year you harvest so the seedlings will be ready for planting. The schedule would be laid out in your forest management plan.

Some First Nations have successfully transplanted wildlings (naturally produced seedlings). It is a relatively inexpensive way to replant small areas where natural regeneration has been uneven. If you set up a "bush nursery" you can grow your own wild stock for fill-in planting.

Checkups to see how the new crop is progressing, known as silviculture surveys, are carried out on young plantations and naturally regenerated stands when seedlings are at least five years old. These assessments measure height, condition and freedom from competing vegetation. They determine the follow-up action, fill-in planting, brushing or juvenile spacing needed to ensure that the trees are growing freely. As these surveys are complicated and require a thorough knowledge of silviculture, assistance from a forestry consultant is recommended.

Reforestation

Reforestation means establishing a free-growing stand of trees, either artificially, by planting, or through natural regeneration.

There are four ways to approach reforestation.

- Let nature handle it (natural regeneration) - the cheapest but slowest way.
- Assist nature (seed tree selection and site preparation) - more expensive.
- Jump-start nature (artificial regeneration by planting trees) - the most expensive but quickest method.
- Combine the above methods for another approach.

Your goals, the species of trees you want, what can grow on the site and the method of regeneration you prefer will determine your approach. Are you just filling in a clearing in the forest with a species you want to retain? Or do you want to start with a new species? Do you want trees to improve the wildlife habitat? To improve the stability of the soil and the stream bank? To create windbreaks? To produce fuel wood? Sawlogs? Christmas trees? Do you want a mix of species, such as hardwoods for annual firewood harvest and softwoods for long-term investment in a future crop?

Natural Regeneration

In a managed forest you can help natural regeneration (seeds carried by wind, birds or animals) by preparing a seedbed. Later on, when the trees are growing, you can help again by periodically removing competitive growth in order to enhance the preferred species. The intensive treatments

for periodic removals are described later in this section.

Artificial Regeneration

Artificial regeneration (by seeding or planting seedlings) gives you maximum control over the species, spacing and timing of regeneration. You can choose between seedlings and seeds. In general, seedlings ensure regrowth more quickly because they have a one-to-five-year head start on plants sprouted from local seed. The type of stock, the age of seedlings to plant and any required on-site supervision depend on several factors — namely, brush competition, the soil and the potential for browsing by livestock or wildlife. A forester can advise on these matters.

Planting costs vary with the size and type of stock, the number of trees recommended per hectare, the site preparation needed and the ground conditions which affect the speed of the planters.

Quality means everything in planting. Since it is expensive, you want to do it only once, and correctly.



Figure 6
A free-growing tree is taller than the surrounding vegetation.

Reforestation cannot be considered successful until the trees have survived infancy and early competition from other vegetation. It could take from five to 10 years, depending on the site and severity of brush competition, before they are truly free-growing.

Brushing



Figure 7
Manual brushing.

Brushing means controlling competing vegetation. Properly done, it ensures that seedlings mature into a free-growing stand.

Brushing is usually carried out in spring or summer. Foresters say stands must be treated before brush starts to compete with seedlings. It is not necessary to own large machines to do the job. Manual cutting with brush hooks, brush saws or power saws works well. In fact, manual brushing is best for sensitive sites such as stream banks, recreational areas, mixed stands where selection cutting is the silviculture system used, or specific problem pockets of the woodland. For small areas even brushing with grazing animals is being tried; sheep are preferred as they do less

damage to young plants than cattle. In exceptional cases, brushing by the application of herbicides might be justified.

The best brushing method for each woodland depends on:

- the extent of vegetation control you are trying to achieve;
- constraints of the terrain;
- the location of the brush and trees you want to remove; and
- the impact your chosen method might have on other resources — animals, plants, water and recreational areas.

Many First Nations are influenced in their choice of method by the job opportunities and the chance to acquire skills that each brushing technique offers.

Mechanical brushing, most common in preparing sites for planting after clear-cuts or fire, uses heavy equipment, such as tractors or skidders mounted with special cutters to clear brush and slash.

Intensive Silvicultural Activities

Intensive treatments are designed to improve the overall forest environment and increase the value of trees. By practising intensive silviculture, First Nations can maintain their timber revenues, even when prices fall, because they are producing and selling products of higher value.

As with basic activities, these treatments are labour intensive. They create jobs in the community and build skills that are also marketable off reserve.

Thinning/Spacing

Thinning removes specifically marked, small-diameter trees, usually by cutting, so light and nutrients are concentrated on the trees that are left. Thinning yields a variety of excellent results: diseased or infected trees are removed; small wood products such as poles, stakes and firewood are salvaged regularly for sale; the major, end timber-crop which is still growing is improved; wildlife habitat is enhanced; areas for forage crops can be created and zones or trails for recreation can be opened.

Thinning also accelerates the growth of the forest. It produces better crop trees to saleable harvest-size in less time — in some cases 75 percent less time — than it would take in an unmanaged forest. In managed stands, the thinnings themselves become saleable products. In unmanaged stands, the commercial value of the trees that should have been thinned out is lost because many of these trees die through competition, squeezed out by hardier neighbours.

Your forest inventory and management plan identify both the trees for thinning and the trees for the final crop. They are, therefore, your guide to producing ongoing, periodic revenues while waiting for the major income crop to mature.

Generally speaking, if there is a local market for small wood products, it is easier for small-scale operators, who don't have the high maintenance costs of heavy machinery, to make a profit from cutting small diameter trees with lower sale value. Many First Nations are in this position.

Deciding how often to thin depends on your own circumstances and the prospects for local sales. First Nations which have occasional markets, or which have to contract out the job, prefer heavy thinnings taken infrequently. Others, who have constant nearby markets for small wood products and First Nation members to do the work themselves, opt for *light* thinnings taken more frequently. The jobs and experience they gain in doing the work and the salaries earned are spin-off benefits to the community. Most often, thinnings can be timed to meet good log markets or your specific timetable.

For First Nations that carry out regular thinning, good roads to their stands are essential so they can go in and out without damaging the end-crop trees or compacting the soil.

Thinning is done at many stages in the development of a stand. It is given different names, depending on the characteristics of the material removed. The first thinning is usually called *juvenile spacing* since it removes very young stems. Juvenile spacing includes *sanitation thinning*, that is, the removal of diseased or defective stems.

The *challenge* in juvenile spacing is to know which trees to leave, since all future treatments focus on the remaining trees and final crop returns depend on them. Logically, the trees left should be the strongest and healthiest ones, already so identified in your inventory and management plan.

The danger is thinning for firewood, or for lumber for residential construction, without a management plan that indicates which trees to cut. Unguided, indiscriminate thinning like this puts at risk the trees that would produce major income later on when they mature. In contrast, with a plan in place, final crop trees are identified and can be protected.

Conifer release is another thinning treatment. Deciduous trees that are overtopping and therefore, suppressing the growth of the more valuable conifers, are removed — thus “releasing” the conifers.

Fertilization



Figure 8
Fertilization: adding nutrients to a forest stand increases its growth.

Fertilizing adds nutrients to the soil of a forest to increase its growth rate and disease resistance.

While most silvicultural treatments focus on maintaining a continuous supply of light, water and soil nutrients, trees sometimes require more nutrients than there are on-site. Nitrogen (N), phosphorous (P), potassium (K) and sulphur (S) are then applied in early spring or late autumn. Two common nitrogen fertilizers, urea pellets and ammonium nitrate crystals, can be spread by hand over small areas with a small cyclone seeder. Like all chemicals they must be applied strictly according to instructions.

Although the laboratory analysis of leaves to see if fertilizer is needed is cheap, the actual fertilization can be expensive over large areas. A screening trial, which takes about a year, is usually done first to establish the trees' ability to take up nutrients. Absorption will be best in spaced or open-grown stands.

Pruning



Figure 9
Pruning: removing live or dead branches from the stems of specific crop trees to produce knot-free timber for high-value sawlogs or veneer and to open trails for recreation and wildlife.

Branches are pruned from the stems of trees to produce clear, knot-free timber for high-value sawlogs or veneer, or to open up trails for recreation and improve access for hunters.

Pruning the lower branches is used also to control pests and, because the lower branches act as conveyor belts carrying ground fires to the treetops, it also reduces the potential for more extensive damage from ground fires.

Cold weather, when growth is minimal or the tree is dormant, is the time to prune. A small-toothed pruning saw or pruning shears are recommended.

Pruning, like thinning, requires skills and knowledge. Understanding the differences among species, and how much live crown should be retained on each, is essential. Too severe pruning limits the tree's ability to produce food, thus reducing its growth and vigour.

It takes years to improve wood quality by pruning. Before adopting a pruning program, it is a good idea to obtain a professional opinion on its potential for increasing timber value in your particular stand.



Figure 10
The stages at which brushing, juvenile spacing, pruning, fertilization, and pre-commercial thinnings take place in a stand's life.

Harvesting, the Environment and Integrated Resource Management

Logging Plans

Modern forest practitioners, when planning a timber harvest, always consider the global woodland environment — that is, all forest resources, not just the trees to be cut. That is why, when logging operations are included in your forest management plan, so too is a logging plan.

A logging plan saves you time and money by laying out ahead of time how various harvesting activities are to be co-ordinated. It is usually presented with a map showing specific cutblock boundaries, main and spur roads, primary and secondary skid trails and landings. For each cutblock in a management area, the plan describes how, and with what equipment, felling will be done, and how the wood is to be forwarded from stump to landing.

Logging Rationale, Strategies and Methods

Why Harvest?

You may decide to harvest timber for a number of reasons: to replace completely one crop with another; to improve, by thinning and spacing, the quality and value of the end crop; to salvage for sale timber that would otherwise be lost because of blowdown, parasites, disease or fire; or to realize the cash value of the end crop you have raised. But when, how and what quantity should you cut? How will you regenerate the area afterwards, and with what species?

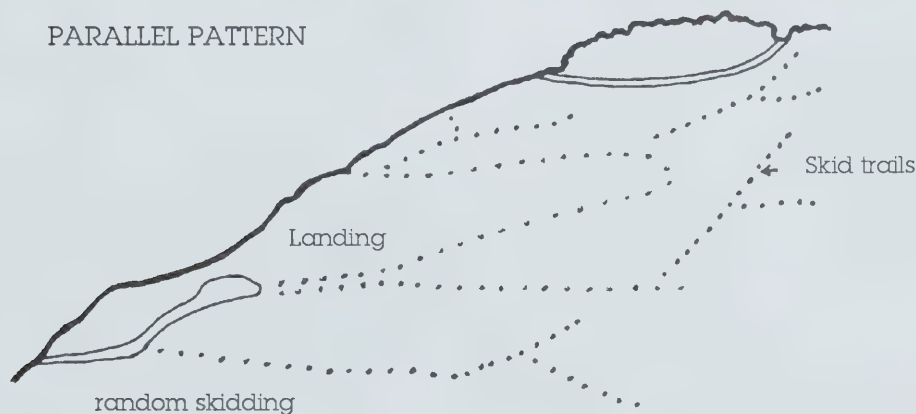


Figure 11
The skid trails are temporary roads to facilitate logging operations.

When to Harvest?

Timing the harvest depends on the age of the stand, its rate of growth, the presence of insects or disease, fire or wind damage, the financial needs of your community and the state of the market. To harvest *before* the stand has reached its maximum annual growth means losing significant volume and revenue. But to harvest *after* this point means retaining a stand whose annual growth in value is slowing down. Of course, if the market is poor, the trees can, and should, be left growing, albeit more slowly, until prices pick up again. As long as fire protection measures are in place and you don't need maximum cash immediately, it is best to hold out for a favourable market. While waiting, you could cut a few commercially valuable trees to provide modest cash flow. However, it's important not to "high-grade," that is, to take only the best trees, while letting the stand as a whole continue growing.

How Much to Cut?

Good forest practice dictates that harvests be more or less equal to the rate at which trees are growing. When the harvesting area of your forest is managed for a sustained yield, your management plan indicates an annual or, since many reserves have relatively small areas, a periodic cut. The plan, of course, builds in flexibility to take account of fluctuating market conditions.

Silviculture Systems

There are three main logging and regenerating methods which foresters call silviculture systems. They use this term because they are describing not just different ways to cut, but also the corresponding ways to prepare a new seedbed after cutting, that is, the ways to regenerate the next crop. The three main silviculture systems currently used are clear-cutting, selection cutting and, to a lesser extent, shelterwood cutting. Each has advantages and disadvantages.

Clear-cutting

Clear-cutting, or removing all trees from an area in one cut, is the most common, and most criticized form of *industrial* harvesting.

This method is used either to remove an entire stand and produce a new, even-aged stand or to introduce to the current stand a new species, such as Douglas fir or lodgepole pine, that requires full sunlight. A forest manager may also be obliged to clear-cut after a fire because it is the most effective way to salvage dead trees and burn-residues, or in unhealthy forests to stop the spread of certain pests and disease.

After clear-cutting, the seeds which have been left when trees are felled, or those blown over from trees bordering the harvested area, can regenerate naturally. Cutting usually coincides, therefore, with the time that trees drop their seeds. A variation of clear-cutting, called the "seed

tree method," leaves selected, wind-firm trees standing, scattered throughout the cutblock, to provide numerous sure seed sources for natural regeneration. The clear-cut area may also be planted with seedlings to improve its appearance immediately.

A management plan prescribing a clear-cut silviculture system outlines the corresponding follow-up treatments — site preparation, possible fill-in planting, and then brushing and juvenile spacing — which promote good natural regeneration.

Advantages

Clear-cutting has two major commercial advantages: it can be carried out easily over large areas at one time, and equipment and logging methods can be chosen without concern for damaging "leave" trees or plants on the forest floor.

Disadvantages

Clear-cutting is totally inappropriate in an area managed for multiple uses under an integrated resource-management plan. It can be harmful to the environment in many ways. Without trees to use the groundwater or rainwater, the soil may become wetter and less stable; nutrients are depleted or washed away. Clear-cutting, particularly on steep slopes, can increase the potential for erosion, landslides and rapid run-off until the area regenerates. Finally, in addition to leaving the land looking raw and naked for several years, the monotonous even-aged forest that clear-cutting creates lacks the appeal of varied, uneven-aged woodlands.



Even-aged forest



Uneven-aged forest.

Figure 12

Selection Cutting

Selection cutting creates or maintains uneven-aged stands. Its objectives are to maximize use of the area, maintain site stability and encourage good regeneration. Under this silviculture system, partial cuttings are made repeatedly so that regeneration is continuous. A permanent forest cover is, therefore, maintained. Mature timber is removed either in small groups or as single trees scattered among younger, not yet marketable trees. Selection cutting is the preferred method for harvesting special products such as pilings, poles, building logs and fencing material.

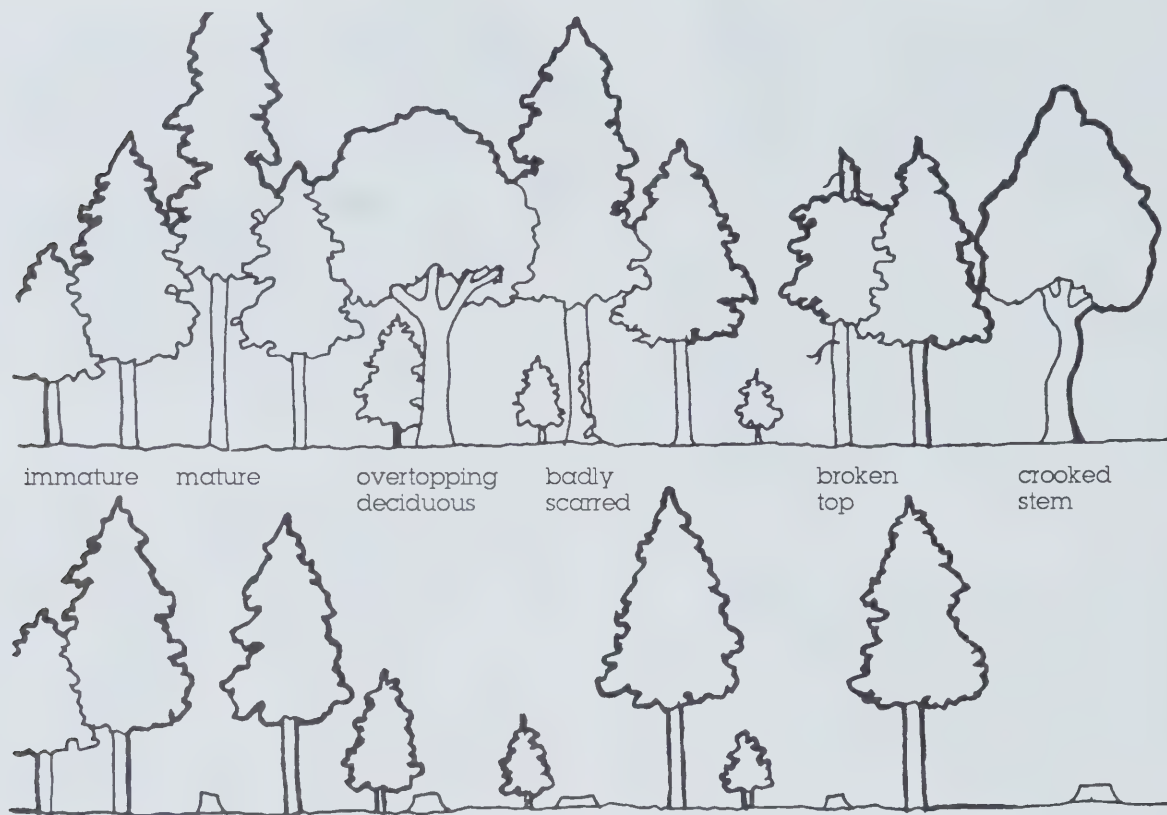


Figure 13
A forest managed by selection cutting.

Advantages

In second-growth forests with potential for significant increases in timber growth and value, the selection cutting system works well. Like thinning, which it closely resembles, it brings in continuous revenues. At the same time, this system encourages the regeneration of more vigorous and resistant species, and improves the health and growing conditions of the plants and trees left on site. *Many reserve woodlands are second-growth forests where the selection cutting system would be ideal.*

The selection system, because it regenerates uneven-aged stands, also encourages wildlife that flourish in habitats created by a mix of young and older trees. In addition, selection cutting protects soil from overexposure because it maintains a more natural forest, and requires fewer mechanical or chemical treatments to make trees thrive. While selection cutting demands care to prevent damage to trees being left ("leave" trees), this greater effort protects, and more completely utilizes, all forest resources.

Selection cutting requires more extensive roads for access than clear-cutting. However, the additional roads are mainly branch roads and skid trails which facilitate fire protection and silvicultural treatments, as well as access for recreation, hunting and trapping.

Disadvantages

Selection cutting requires more difficult and expensive procedures and equipment (particularly with increasing ground slope) to protect the soil, trees, seedlings or other plants remaining on site. However, both the potential costs and damages can be minimized by advance planning and careful supervision of work.

A Note of Caution

A note of caution is in order for those considering the selection system: determining which trees to cut and which to leave requires professional expertise and guidelines specific to each site. The choice of trees to cut has an impact on all future management activities, the final value of the end crop and the global forest environment. A wrong decision can undo years of effort and investment.

Shelterwood Cutting

The shelterwood system is a variant of selection cutting. It is designed for shade-tolerant species which can grow under the canopy of the final crop of trees. Under this system, a sequence of cuttings, also rather like thinnings, gradually removes the original stand of trees. The first cutting creates vacancies in the stand and encourages the natural regeneration of a new crop; subsequent cuttings remove the shelter of the old crop to make growing room for the new one. Under the canopy of mature trees, both seedlings and the soil are protected from overexposure and

temperature fluctuations. Shading also discourages some competing vegetation and may reduce the need for brushing.

Comparative Costs and Cash Flow

Clear-cutting is initially cheaper than either selection or shelterwood cutting, but subsequent silvicultural treatments cost more. The most significant difference among the systems relates, therefore, to cash flow. Clear-cutting brings a higher immediate return, followed by a long delay in income until the second crop grows. Selection and shelterwood cutting offer lower, but continuous revenues because natural regeneration is continuous, proceeding along with small scale, scattered harvesting.

Logging Activities Common to All Systems

Regardless of the cutting system or size of the forest, six basic activities are involved in logging:

- felling and delimbing the trees;
- yarding, or transporting the tree lengths to a central location called a landing;
- bucking, or cutting the tree lengths into logs of prescribed lengths;
- loading the logs onto trucks;
- hauling the logs to the sorting area or mill; and
- disposing of slash, and rehabilitating and preparing the site for regeneration.

Each of these activities can be conducted in a number of ways using a variety of equipment. The choice depends on the material to be harvested, the site conditions and the silviculture system you select.

Felling and Bucking

For First Nations just beginning forestry operations, felling and bucking will be their first logging activities. The purchase of a few chain saws is the only capital outlay for equipment.

Felling and Delimbing

Before starting work, crews are trained carefully. Safe felling and delimbing is an acquired skill which cannot be learned from books or videos alone. It calls for knowledge of equipment and tree behaviour, and instant good judgment to guard against the constant danger of snapping limbs, rolling logs and kickbacks. For these reasons, felling and delimbing should only be done by experienced tree-cutters working under an even more experienced foreman/forewoman.

Yarding and Skidding

Yarding means transporting logs from the stump to the landing where they are loaded onto trucks. On steep slopes, logs are usually moved by machines that partially lift them.

On flat or rolling terrain, skidders or crawler tractors drag the logs with heavy wire cables called "chokers" or with grapple hooks. Skidding can also be done with draft animals and, with less danger to man and beast, with specially designed, small winches.

Bucking, or Cutting Felled Trees into Logs

Bucking is usually done by the feller, either in the woods or at roadside landings before hauling to the mill. Correct bucking can actually increase the value of your logs by removing defects or creating special

products. Simple things, such as square cut ends, and accurate measurement to include trim allowances, can mean the difference between getting the top or bottom dollar for your log.

Decisions on how to buck a log depend on the tree's quality, the distribution of knots and knowing what the buyer wants. An experienced, knowledgeable foreman/forewoman in charge of the bucking crew can ensure correct bucking for maximum profitability of your operations.

Loading

Many First Nations were encouraged to develop their forests when the self-loading logging truck revolutionized small-scale operations, making it profitable to recover small volumes of material — even one or two truckloads. If a self-loader is not available in your area, front-end or wheeled loaders with grapple hooks can also be used profitably for small-scale operations. Alternatively, First Nations who don't want to buy any equipment can contract out the loading.

Hauling

Hauling is often contracted out. Its cost is affected not only by distance from the mill or log dump, but also by landing organization and loading efficiency. Your First Nation can, therefore, control hauling costs, often a large portion of overall logging costs, through careful advance planning of road and landing layouts. A professionally designed logging plan will locate your landings and skid trails for efficient, environmentally sound operations and cost-effective loading and hauling to maximize profits.

Slash Disposal and Site Rehabilitation/Preparation

When a logging operation is finished, the residue, called "slash," is handled to reduce fire hazards and to prepare the site for reforestation. This residue is usually slashed to lie flat and decompose faster so it fertilizes the area for planting — hence its name. Alternatively, the slash can be spread and "broadcast" burned throughout the cutblock. In this case, firebreaks and other safety measures will be necessary and a burning permit may be required. The debris accumulated at landings is spot burned — rather than buried under road construction areas — because it is not stable enough for fill.

Affordable Logging and Processing Equipment for Small Operations

If a First Nation company, or the First Nation itself, does the logging or any phase of it, it will have to choose equipment to rent or buy. The choice depends on several factors: the size of the operations, which jobs it is going to do, whether it will do them with hand-held equipment or with heavy machinery, and what the comparative performance, risks and costs of the different machines on the market may be.

Often, First Nations join forces to keep costs down. Like co-operatives, they share expenses for jointly used equipment, as well as for other operations like hauling that they contract out.

The growing interest in forestry on reserves has increased interest in the less expensive, scaled-down equipment, including portable saw mills, now readily available.

Some First Nations, however, are not yet prepared to purchase machinery. Instead, a few of them have modified basic farm machines they already own for yarding, skidding or site preparation. In so doing, their most important concern was safety, since on slopes or with larger, heavy logs, tractors can be pulled over backwards without warning. Other First Nations have investigated horse logging for use in sensitive or wet areas, and for selection cutting, thinning or loading. They have also become aware of the need to deal with concerns that horse logging raises about safety, and about the treatment of animals working in the bush.

Protecting the Environment

Unplanned harvesting can damage the environment. The best time to protect the environment is before harvesting begins; the best way to prevent environmental damage is to review your logging plan from the environmental perspective. Look specifically for activities that could damage the environment. If you find any, revise your plan to prevent or limit the damage. There are a number of things to look for.

- Harvesting on steep slopes can accelerate water run-off into streams and lakes, and thereby damage fish habitat and affect drinking water supplies. It can also lead to erosion by carrying away topsoil and inhibiting future regeneration of the forest.
- Harvesting near streams, lakes and rivers can cause debris to enter waterways, disrupting fish habitat, and increase water temperatures by reducing shade.

- Harvesting in wetlands and permafrost can cause long-term disruption in the ecology of an area, because the harvesting equipment can disturb the soil, cause ruts, disrupt drainage, and leak oils and other fluids into the environment.
- Harvesting in ecologically unique areas can lead to the irreversible loss of the unique species inhabiting the area.
- Harvesting in areas likely to be seen by tourists can destroy natural settings and scenic beauty.
- Harvesting in breeding and nesting areas, or on migration paths, can adversely affect wildlife. Access roads can make it easier for hunters to reach wildlife.

Where the logging plan contains components likely to lead to environmental damage, it should be modified. In many cases, measures can be taken that will limit harvesting damage. For example, harvesting in wetlands can be scheduled during winter, and skidders with wide tires can be used. Harvesting near the breeding areas of wildlife can be scheduled outside the breeding season.

Harvesting operations must also be carried out with care. Logging debris needs to be managed to reduce fuel sources in the event of a fire. Cutting, grinding and welding metals, or the improper handling of flammable substances can lead to forest fires. Careless skidding and yarding can damage standing trees.

Legal and Regulatory Requirements for Harvesting

The purpose of the forestry provisions of the *Indian Act* and the Indian Timber Regulations is to assist First Nations to secure economic benefits from their forest resources, while protecting the environment and providing for the stewardship of the forest resource.

To achieve these objectives, the *Indian Act* creates offences for cutting and removing timber from a reserve without permission of the Minister of Indian Affairs and Northern Development. In granting permits or licences to cut timber, the Minister seeks to ensure that timber revenues are collected for the benefit of the First Nation. A logging plan is normally required before a permit or licence is issued. It is reviewed to determine whether there are environmental implications. If so, the logging plan may need to be revised to reduce or limit environmental damage. First Nation Councils must consent to permits and licences issued for reserve land. They are encouraged to seek independent legal and professional advice before giving their consent.

If your First Nation wants to harvest on provincial Crown lands, it will also have to obtain a permit. While some details of requirements for a permit vary from province to province, applications usually must include a cruise summary and maps, appraisal data, silvicultural prescriptions and a logging plan.

How Will You Be Paid for Your Timber?

Scaling and Grading to Determine Price

When timber is cut for sale, it is "scaled," either by the volume of the piece or by its weight, to measure the quantity or volume of timber logged. In addition, in many regions, when logs are scaled they are also graded to determine their value. They are then bought or sold by grade category. The grade is determined by the size, growth rate, form or shape of the log, and the presence and size of knots and rot or insect damage.

Pricing Special Products

Special products are specially measured for pricing. For example, pulpwood is measured and scaled in stacked cubic metres; firewood is measured and sold in cords.

Christmas trees are graded by form, density, height and species; poles, pilings and building logs are "stick-scaled" for length and diameter and priced accordingly.

Forest Access

A good road network through the forest is expensive; nevertheless, it is essential to provide ready access for silvicultural activities and efficient harvesting and for firefighting. That is why road building and repair is the first activity listed in the sample five-year operational plan presented in Table 6 (p.21). Logging operations are often blamed for stream pollution, erosion and siltation. Frequently, however, it is not the logging, but the roads built to carry out operations, that caused the damage.

A good road network is not always beneficial. Good roads can bring people to areas you may not want visited — ecologically sensitive areas, wildlife breeding areas, spiritually or culturally significant sites. This is important to keep in mind when planning roads.

Plan your road network, preferably on paper first. Aerial photos and contour maps can help your planning. Consider the following when developing a road network: follow contour lines where possible, and try to keep grades to below 10 percent; keep away from depressions which may catch and hold water; avoid swamps and rock outcrops which can be trouble spots; minimize stream crossings; keep a distance from streams - the distance will depend on the slope of the land; leave a "green belt" from the road to the stream to minimize erosion; include flat landings for loading logs onto trucks; avoid unstable soils which can cause erosion; and look for gravel deposits for use in road surfacing and culvert beds.

Construction standards should relate directly to projected use. Good engineering and construction can keep costs to acceptable levels. The proper timing of construction activities can reduce costs and environmental damage.

Road planning must also take into account maintenance requirements, including grading, ploughing and sand.

Building major roads requires specialized expertise to minimize harm to the environment, as well as heavy equipment. Consequently, First Nations often contract out road building and the design of culverts to qualified professionals. They stipulate the employment of First Nation members, where feasible, as part of these contracts.

A road-building contract can call for a finished roadway at a lump sum price, or for the job to be done at hourly rates that include manpower and equipment. Whichever format you choose, a clear contract drawn up by a lawyer, with technical specifications prepared by an engineer, is the best approach.

While some First Nations have road-construction experience and operate heavy machinery to do their own work, many more limit road activities to minor construction and regular maintenance by their own crews. They train some crew members to identify trouble spots — potential flooding and erosion areas at culverts and steep grades — others to check roads after heavy rains and heavy traffic, and still others to carry out springtime repairs such as checking and clearing all drainage structures. Most of this maintenance requires only hand tools, some gravel and a truck.

Often First Nation fire crews double as road maintenance crews, performing this work outside the fire hazard season or when they are on stand-by. These crews also contract out their services to the municipality, to hydro or housing developers and to federal or provincial parks. Here again, forestry development in the community has laid the foundation for employment off reserve, in jobs that are a spin-off from the community's forestry operations.

Protecting Your Woodlands

Each year, millions of hectares of forest are damaged or destroyed by fire, insects and disease. Protection aims to keep these problems within acceptable limits so that forest management objectives can be achieved. It is an ongoing task of prevention, early detection and control.

Protection Against Pests and Diseases

Pests and diseases retard growth, reduce wood quality, kill trees and often create fire hazards. Prevention and early detection are the best approach to pest problems.

Planting disease- and pest-resistant species, managing stands to maintain a mixture of species and age classes, harvesting stands before they become overmature and maintaining clean logging practices are typical prevention measures which can be built into forest management plans.

To detect pest and disease problems, become familiar with the general warning signs of diseases and pests currently active in your area, and particularly with those diseases and pests which attack the types of trees in your forest. Then, check your woodlands for potential problems at every available opportunity — walks, road construction, harvesting. When you suspect a problem, take samples of the diseased tree and consult your provincial forestry department and other professionals for help in identifying the problem and developing a solution.

Fire Prevention and Suppression

Preventing fires means protecting not just timber, but homes, range and recreation areas, wildlife habitats and watersheds as well. The best protection against fire is to identify potential fire hazards and eliminate them. You can do this by adopting rigorous site-rehabilitation measures to dispose of logging debris, a readily combustible fuel for fires. You can take further precautions by carefully storing gasoline and other hazardous fuels for machines to minimize fire dangers. You can inform forest users about the dangers of a forest fire and how to prevent it. Finally, you can take measures to restrict or control forest use when the risks of fire are high.

Early detection of fires will limit damage. You should ensure that First Nation members know whom to call when they spot a fire. Keep track of provincial fire-hazard ratings in your area. When fire risks are high, regular ground patrols, fire towers and spotters can help detection.

Prepare to fight fires before they happen. Some First Nations keep maps and firefighting equipment handy. They have fire attack plans, particularly important where help could be long in arriving, and have joined with other First Nations or tribal councils to set up well-equipped, well-trained firefighting teams. These teams are on permanent stand-by in some areas, ready to be flown wherever they are needed.

The Business of Forest Management

It is important to treat the management of on-reserve forests as a business. Manage the business well, and it can not only survive into the future, but also prosper. However, success is not automatic and requires hard work and careful attention.

Investing in Forest Management

In forest management, as in other businesses, you need to invest resources — time and money — to earn income. Your forest can generate revenues in many ways: the sale of timber and other forest products, trapping and hunting, and recreational uses. If used for forest management, these revenues can help finance future investments in the forest. These investments can provide long-term, sustainable benefits. One way to ensure continued investment in the forest is to adopt a community policy that forest revenues be reinvested in the community forest.

Remember that forest management is a long-term process, requiring sustained effort over a long period of time. In addition, the primary return from forest management investments is typically in the form of jobs for community members in timber harvesting, tourism, trapping and other forest activities.

Each investment should be carefully weighed against the expected return, in whatever form, to ensure that it is the best use of available resources.

Striving to be Efficient

In managing the reserve forest, efficiency is very important. The resources of your forest — whether timber or other forest products, recreation or wildlife — will be competing for markets with similar products from off-reserve forests. Success in open competitive markets requires hard work, care and attention.

Administrative Options

Many First Nation Councils, fully occupied by other demanding projects, have concluded that they cannot give adequate care and attention to forestry development as well. They have, therefore, considered other options for administering their forests. Some entrust forestry projects to First Nation corporations, others to committees of council or interested members and still others to an expert consultant.

Beyond the Reserve Forest

For most First Nations, the reserve forest does not, by itself, provide a sufficient resource base for a viable business. It is too small to offer long-term, full-time jobs for a core of key employees — in this case, trained crews, experienced foremen/forewomen, managers and marketers. If there is insufficient work, these people, so important to the success of the business, will move on. Few businesses can survive when key staff are continually leaving.

Consequently, for long-term viability, many First Nations seek business opportunities beyond reserve boundaries. They look at off-reserve opportunities in harvesting, planting, silviculture, clearing for power line rights-of-way, road construction and fire protection or suppression. They may also investigate the feasibility of manufacturing specialty products. In short, as First Nations exploit various opportunities, managing the reserve forest becomes only one element of a forest-based, long-term development strategy that includes several different business initiatives.

Within the First Nation's long-term strategy, the role of reserve forest management varies over time. In the initial years, it provides opportunities for on-the-job training and direct work experience for First Nation members and for establishing credibility in the open market. In later years, it provides a core of guaranteed work which can be supplemented with off-reserve contracts.

The Role of Planning

Businesses which plan perform better than those that do not. Forest management planning will help you determine community objectives for your forest. It will help you make informed decisions regarding your options, and help you decide upon an operational plan which will identify what is to be done, by whom and when. It will include a business plan which estimates the cost of each activity and identifies where the money will come from and when. It can include a training plan, which will help ensure community members have the skills to carry out the work in the community forest. *Forest management planning is the starting point for a successful forestry business.*

Appendix A

Advisory and Assistance Programs

Government Offices

Help is available from a number of federal departments. Federal services available at the time of writing are summarized below.

The **Lands and Trust Services Sector** of the **Department of Indian Affairs and Northern Development** can provide information and assistance regarding timber permits and licences. Office addresses and telephone numbers are listed in Appendix B. In addition, communities can use the Department's Post-Secondary Education Program to train community members for forestry occupations. The Department also assists communities with financing for negotiations to gain access to off-reserve resources such as forestry service contracts and logging permits through the Resource Access Negotiations Program.

The **Canadian Forest Service** of **Natural Resources Canada** can assist with technical advice and other assistance related to forest management. A complete list of regional forestry offices of the Canadian Forest Service is provided in Appendix C.

Industry Canada is available to assist with the development and operation of forestry-related businesses. **Human Resources Development Canada** can provide financial assistance for training. In addition to federal programs, most provincial and territorial governments can provide assistance through natural resource departments. Ask both federal and provincial/territorial ministries for publications describing their programs for training, development and business assistance. In addition, there are universities, community colleges and other training institutions. As well, many provinces have organizations which deal specifically with Aboriginal affairs.

Non-government Institutions

National Aboriginal Forestry Association (NAFA)

875 Bank Street
Ottawa, Ontario
K1S 3W4
(613) 233-5563

Aboriginal Training Institutes

- Arctic College, Yellowknife, Northwest Territories
- National Indian Forest Institute, Meadow Lake, Saskatchewan
- Nicola Valley Institute of Technology, Merritt, British Columbia
- Sault College of Applied Arts and Technology, Sault Ste. Marie, Ontario
- Western College of Applied Arts, Technology and Continuing Education, Stephenville, Newfoundland
- Yukon College, Whitehorse, Yukon

Appendix B

Offices of the Department of Indian Affairs and Northern Development

Headquarters

Environment and Natural Resources
Directorate
Department of Indian Affairs and
Northern Development
Les Terrasses de la Chaudière
10 Wellington Street
Hull, Quebec K1A 0H4
(819) 997-9272

Regional Offices

Atlantic Region

Department of Indian Affairs and
Northern Development
40 Havelock Street
P.O. Box 160
Amherst, Nova Scotia B4H 3Z3
(902) 661-6336

Quebec Region

Department of Indian Affairs and
Northern Development
320 St. Joseph Street East
P.O. Box 51127, Postal Outlet G. Roy
Québec, Quebec G1K 8Z7
(418) 648-7675

Ontario Region

Department of Indian Affairs and
Northern Development
25 St. Clair Avenue East, 5th Floor
Toronto, Ontario M4T 1M2
(416) 973-2281

Manitoba Region

Department of Indian Affairs and
Northern Development
275 Portage Avenue, Room 1100
Winnipeg, Manitoba R3B 3A3
(204) 983-4692

Yukon Region

Department of Indian Affairs and
Northern Development
300 Main Street
Whitehorse, Yukon Y1A 2B5
(403) 667-3146

Saskatchewan Region

Department of Indian Affairs and
Northern Development
2nd Floor
2110 Hamilton Street
Regina, Saskatchewan S4P 4K4
(306) 780-6442

Alberta Region

Department of Indian Affairs and
Northern Development
630 Canada Place
9700 Jasper Avenue
Edmonton, Alberta T5J 4G2
(403) 495-2815

British Columbia Region

Department of Indian Affairs and
Northern Development
1550 Alberni Street, Suite 300
Vancouver, British Columbia V6G 3C5
(604) 666-5232

Northwest Territories Region

Department of Indian Affairs and
Northern Development
4914 50th Street
P.O. Box 1500
Yellowknife, Northwest Territories X1A 2R3
(403) 920-8188

Appendix C

Offices of the Canadian Forest Service

Headquarters

351 St. Joseph Boulevard
Hull, Quebec K1A 1G5
Tel: (819) 997-1107
Fax: (819) 953-7048

Regional Offices

Pacific and Yukon Region

506 West Burnside Road
Victoria, British Columbia V8Z 1M5
Tel: (604) 363-0705
Fax: (604) 363-0775

Northwest Region

5320 122nd Street
Edmonton, Alberta T6H 3S5
Tel: (403) 435-7279
Fax: (403) 435-7359

Saskatchewan District Office

1288 Central Avenue
Prince Albert, Saskatchewan S6V 4V8
Tel: (306) 953-8546
Fax: (306) 953-8649

Manitoba District Office

180 Main Street, Suite 104
Winnipeg, Manitoba R3C 1A6
Tel: (204) 983-4817
Fax: (204) 983-8792

Ontario Region

1219 Queen Street East
P.O. Box 490
Sault Ste Marie, Ontario P6A 5M7
Tel: (705) 949-9461
Fax: (705) 759-5700

Quebec Region

1055 rue du P.E.P.S.
P.O. Box 3800
Sainte-Foy, Quebec G1V 4C7
Tel: (418) 648-7135
Fax: (418) 648-5849

Maritime Region

Regent Street South
P.O. Box 4000
Fredericton, New Brunswick E3B 5P7
Tel: (506) 452-3638
Fax: (506) 452-3525

Truro Sub-office

664 Prince Street
P.O. Box 667
Truro, Nova Scotia B2N 5E5
Tel: (902) 893-0094
Fax: (902) 893-4468

Appendix D

Provincial and Territorial Forestry Departments

Department of Forestry and Agriculture
Confederation Building Complex
P.O. Box 4750
St. John's, Newfoundland A1C 5T7
Tel: (709) 729-2704
Fax: (709) 729-5798

Department of Agriculture, Fisheries and
Forestry
Forestry Operations
P.O. Box 2000
Charlottetown, Prince Edward Island
C1A 7N8
Tel: (902) 368-4700
Fax: (902) 368-4703

Department of Natural Resources
Founders Square
1701 Hollis Street
P.O. Box 698
Halifax, Nova Scotia B3J 2T9
Tel: (902) 424-5935
Fax: (902) 424-7735

Department of Natural Resources and
Energy
P.O. Box 6000
Fredericton, New Brunswick E3B 5H1
Tel: (506) 453-2684
Fax: (506) 453-2930

Ministère des Ressources naturelles
880, Sainte-Foy Road, Door 4.50
Québec, Quebec G1S 4X4
Tel: (418) 646-4360
Fax: (418) 643-3908

Ministry of Natural Resources
Provincial Operations Branch
Robertta Bondar Place, Suite 400
70 Foster Drive
Sault Ste. Marie, Ontario P6A 6V5
Tel: (705) 945-6676
Fax: (705) 945-6667

Manitoba Natural Resources
Forest Management
530 Kenaston Boulevard, Suite 300
Winnipeg, Manitoba R3N 1Z4
Tel: (204) 945-7951
Fax: (204) 489-1360

Department of Environment and
Resource Management
Forestry Branch
McIntosh Mall, P.O. Box 3003
Prince Albert, Saskatchewan S6V 6G1
Tel: (306) 953-2221
Fax: (306) 953-2360

Department of Environmental Protection
Alberta Land and Forest Services
Forest Management Division
8th Floor, Bramalea Building
9920 108th Street
Edmonton, Alberta T5K 2M4
Tel: (403) 427-8401
Fax: (403) 427-0084

Ministry of Forests
722 Johnson Street
Victoria, British Columbia V8W 3E7
Tel: (604) 387-6722
Fax: (604) 387-5999

Indian Affairs and Northern Development
Forest Resources, Northern Affairs Program
500 Main Street, Suite 345
Whitehorse, Yukon Y1A 3B5
Tel: (403) 667-3350
Fax: (403) 667-3138

Department of Renewable Resources
Forest Management Division
Scotia Centre
Yellowknife, Northwest Territories X1A 2L9
Tel: (403) 920-6406
Fax: (403) 920-4218

